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Content
October 2019

Upper extremity
Arthroscopy
Volume 35, issue 10

- Characterization of Posterior Glenoid Bone Loss Morphology in Patients With Posterior Shoulder Instability
- The 6-O'clock Anchor Increases Labral Repair Strength in a Biomechanical Shoulder Instability Model
- A Prospective Randomized Trial Comparing Suture Bridge and Medially Based Single-Row Rotator Cuff Repair in Medium-Sized Supraspinatus Tears
- The Impact of Workers' Compensation on Patient-Reported Outcomes Measurement Information System Upper Extremity and Legacy Outcome Measures in Patients Undergoing Arthroscopic Rotator Cuff Repair
- Does an Increased Critical Shoulder Angle Affect Re-tear Rates and Clinical Outcomes Following Primary Rotator Cuff Repair? A Systematic Review

Journal of Shoulder and Elbow Surgery (JSES)
Volume 28, issue 10

- Rotator cuff tendon tissue cut-through comparison between 2 high–tensile strength sutures
- Fluid retention after shoulder arthroscopy: gravity flow vs. automated pump—a prospective randomized study
- Arthroscopy of the symptomatic shoulder arthroplasty
- The primary cost drivers of arthroscopic rotator cuff repair surgery: a cost-minimization analysis of 40,618 cases
- Arthroscopic glenoid labral lesion repair using all-suture anchor for traumatic anterior shoulder instability: short-term results
- Surgical outcomes for post-traumatic stiffness after elbow fracture: comparison between open and arthroscopic procedures for intra- and extra-articular elbow fractures

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA)
Volume 27, Issue 10

- Anatomic ligament consolidation of the superior acromioclavicular ligament and the coracoclavicular ligament complex after acute arthroscopically assisted double coracoclavicular bundle stabilization
- Double-row rotator cuff repairs lead to more intensive pain during the early postoperative period but have a lower risk of residual pain than single-row repairs
- No healing improvement after rotator cuff reconstruction augmented with an autologous periosteal flap
- Intraoperative graft-related complications are a risk factor for recurrence in arthroscopic Latarjet stabilisation
- Arthroscopic repair of HAGL lesions yields good clinical results, but may not allow return to former level of sport
- Locating the ulnar nerve during elbow arthroscopy using palpation is only accurate proximal to the medial epicondyle

BACK

- Modified anteromedial and anterolateral elbow arthroscopy portals show superiority to standard portals in guiding arthroscopic radial head screw fixation

Lower extremity

Arthroscopy

Volume 35, issue 10

- Traction Time, Force and Postoperative Nerve Block Significantly Influence the Development and Duration of Neuropathy Following Hip Arthroscopy
- Return to Basketball After Hip Arthroscopy: Minimum 2-Year Follow-up
- A Shift in Hip Arthroscopy Use by Patient Age and Surgeon Volume: A New York State–Based Population Analysis 2004 to 2016
- Comparison Between 3-Dimensional Multiple-Echo Recombined Gradient Echo Magnetic Resonance Imaging and Arthroscopic Findings for the Evaluation of Acetabular Labrum Tear
- Second-Look Arthroscopic Evaluations of Meniscal Repairs Associated With Anterior Cruciate Ligament Reconstruction
- Variability of the Composition of Growth Factors and Cytokines in Platelet-Rich Plasma From the Knee With Osteoarthritis
- A Magnetic Resonance Imaging Analysis of Shrinkage of Transplanted Fresh-Frozen Lateral Meniscal Allografts During a Minimum Follow-up of 8 Years
- Comparison of Clinical and Radiologic Outcomes Between Normal and Overcorrected Medial Proximal Tibial Angle Groups After Open-Wedge High Tibial Osteotomy
- Primary Medial Patellofemoral Ligament Repair Versus Reconstruction: Rates and Risk Factors for Instability Recurrence in a Young, Active Patient Population
- Study of the Nerve Endings and Mechanoreceptors of the Anterolateral Ligament of the Knee
- Vascular Compromising Effect of Drilling for Osteochondral Lesions of the Talus: A Three-Dimensional Micro–Computed Tomography Study

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA)

Volume 27, Issue 10

- Athletes experience a high rate of return to sport following hip arthroscopy
- Postoperative alpha angle not associated with patient-centered midterm outcomes following hip arthroscopy for FAI
- Virtual reality hip arthroscopy simulator demonstrates sufficient face validity
- Arthroscopic irrigation and debridement is associated with favourable short-term outcomes vs. open management: an ACS-NSQIP database analysis
- Immediate arthroscopy following ORIF for tibial plateau fractures provide early diagnosis and treatment of the combined intra-articular pathologies
- What are the prevalence and risk factors for repeat ipsilateral knee arthroscopy?

American Journal of Sports Medicine (AJSM)

Volume 47, Issue 12

- Patient-Specific 3-D Magnetic Resonance Imaging–Based Dynamic Simulation of Hip Impingement and Range of Motion Can Replace 3-D Computed Tomography–Based Simulation for Patients With Femoroacetabular Impingement: Implications for Planning Open Hip Preserv
- Portal Placement and Biomechanical Performance of Endoscopic Proximal Hamstring Repair

BACK

Miscellaneous
Arthroscopy
Volume 35, issue 10

- Demographics and Distal Tibial Dimensions of Suitable Distal Tibial Allografts for Glenoid Reconstruction

BACK

Upper extremity

Arthroscopy, Volume 35, Issue 10

Characterization of Posterior Glenoid Bone Loss Morphology in Patients With Posterior Shoulder Instability

Brendin R. Beaulieu-Jones, B.A., Liam A. Peebles, B.A., Petar Golijanin, B.S., Justin W. Arner, M.D., Travis J. Dekker, M.D., George Sanchez, B.S., Ryan F. McClellan, B.S., Anthony Sanchez, B.S., James P. Bradley, M.D., CAPT Matthew T. Provencher, M.D.

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Purpose
To systemically describe posterior bone defects in the setting of posterior shoulder instability based on several parameters, including surface area, slope and version, defect height from the base of the glenoid, and extent of bone loss at equal intervals along the long axis of the fossa.

Methods
A total of 40 young, active individuals with recurrent posterior shoulder instability and a bony injury confirmed on either computed tomography (n = 18; mean age, 26.3 ± 4.0 years) or magnetic resonance imaging (n = 22; mean age, 20.0 ± 4.9 years) were identified. The posterior glenoid bone defect was characterized using the following measures: (1) percentage of bone loss, (2) glenoid vault version, (3) slope of the posterior defect relative to the glenoid surface, (4) superior-inferior length of the defect, and (5) anterior-posterior width of the defect at 5 intervals along the glenoid fossa.

Results
The mean age of the 40 patients was 22.9 ± 5.5 years (range, 14.9-35.5 years). The mean surface area of glenoid bone loss was 9.7% ± 4.7%. Glenoid version measured at 5 equal intervals along the inferior two-thirds of the glenoid was 12.8° ± 4.9°, 11.9° ± 5.0°, 10.1° ± 6.3°, 10.5° ± 6.5°, and 8.7° ± 7.2° from superior to inferior. The mean slope of the posterior defect relative to the glenoid fossa was 26.8° ± 11.5°. The mean superior-inferior height of the bony defect was 21.9 ± 0.4 mm. The anterior-posterior sloped width of the defect at 5 equal intervals along the glenoid fossa was 0.9 ± 1.5 mm, 2.8 ± 2.4 mm, 4.0 ± 1.7 mm, 4.0 ± 2.1 mm, and 2.9 ± 2.6 mm from superior to inferior. Low-grade (<10%) bone loss was diagnosed in most shoulders (23 of 40 evaluated), whereas 15 had moderate bone loss (10% to <20%) and 2 had high-grade bone loss (≥20%).

Conclusions
Posterior glenoid bone loss is characterized by a loss of posterior bony concavity, increased slope from anterior to posterior, and increased posterior version. The most anterior-posterior sloped width was quantified at the third and fourth intervals of 5 equal intervals from superior to inferior. This study highlights that patients with posterior instability have bone loss that is sloped relative to the glenoid fossa and suggests that management must be appropriately tailored given the distinctiveness of posterior bone loss.

Level of Evidence
Level IV, case series.

BACK

The 6-O'clock Anchor Increases Labral Repair Strength in a Biomechanical Shoulder Instability Model

Steven L. Bokshan, M.D, Steven F. DeFroda, M.D., M.E., Joseph A. Gil, M.D., Rohit Badida, M.Eng., Joseph J. Crisco, Ph.D., Brett D. Owens, M.D.

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Purpose
To characterize the additive effect of a 6-o'clock anchor in the stabilization of a Bankart lesion.

Methods
Twelve cadaveric shoulders were tested on a 6-df robotic musculoskeletal simulator to measure the peak resistance force due to anterior displacement of 1 cm. The rotator cuff muscles were loaded dynamically. The test conditions consisted of the intact shoulder, Bankart lesion, Bankart repair (3-, 4-, and 5-o'clock anchors), and Bankart repair with the addition of a 6-o'clock anchor. A 13% anterior bone defect was then created, and all conditions were repeated. Repeated-measures analysis of variance was performed.

Results
In the group with no bone loss, the addition of a 6-o'clock anchor yielded the highest peak resistance force (52.8 N; standard deviation [SD], 4.5 N), and its peak force was significantly greater than that of the standard Bankart repair by 15.8% (7.2 N, P = .003). With subcritical glenoid bone loss, the repair with the addition of a 6-o'clock anchor (peak force, 52.6 N; SD, 6.1 N; P = .006) had a significantly higher peak resistance force than the group with bone loss with a Bankart lesion (35.2 N; SD, 5.8 N). Although the 6-o'clock anchor did increase the strength of the standard repair by 6.7%, this was not statistically significant (P = .9) in the bone loss model.

Conclusions
The addition of a 6-o'clock suture anchor to a 3-anchor Bankart repair increases the peak resistance force to displacement in a biomechanical model, although this effect is lost with subcritical bone loss.

Clinical Relevance
This study provides surgeons with essential biomechanical data to aid in the selection of the repair configuration.

BACK

A Prospective Randomized Trial Comparing Suture Bridge and Medially Based Single-Row Rotator Cuff Repair in Medium-Sized Supraspinatus Tears

Kotaro Yamakado, M.D., Ph.D.

Arthroscopy, Volume 35, Issue 10

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Purpose
To compare the clinical and imaging outcomes between the suture bridge technique (SB) and the medially based single-row technique (medSR) in patients with 1- to 3-cm tear sizes.

Methods
All patients were evaluated preoperatively and postoperatively (at 12 and 24 months) using the modified University of California, Los Angeles scoring system; active range of motion (flexion and external rotation); and a visual analog scale for pain. Healing status was examined by postoperative magnetic resonance imaging.

Results
Clinical and imaging evaluations were completed by 92 patients at 1-year follow-up and by 74 patients at 2 years. No significant differences were found between the 2 groups across all measures at final follow-up: The University of California, Los Angeles scores were 33.4 points in SB patients and 33.0 points in medSR patients (P = .58); the visual analog scale scores were 6 mm and 7 mm, respectively (P = .38); the active flexion angles were 161° and 159°, respectively (P = .34); and the external rotation angles were 49° and 52°, respectively (P = .37). Retears were observed in 6.5% of SB patients and 2.1% of medSR patients (P = .31). Medial cuff failure was observed only in SB patients (4.3%, 2 cases), whereas incomplete healing (deep-layer retraction pattern) was observed only in medSR patients (8.7%, 4 cases). Neo-tendon regeneration in the medSR group was observed in 93% of patients.

Conclusions
This study did not show any significant differences in the clinical outcomes and cuff integrity between the 2 treatment groups at final follow-up; however, medial cuff failure was observed only in the SB group, and incomplete healing was more frequent in the medSR group. One should consider the risk of medial cuff failure and incomplete healing of the repaired cuff before choosing the repair technique for medium-sized supraspinatus tears.

Level of Evidence
Level I, therapeutic, prospective, randomized trial.

BACK

The Impact of Workers' Compensation on Patient-Reported Outcomes Measurement Information System Upper Extremity and Legacy Outcome Measures in Patients Undergoing Arthroscopic Rotator Cuff Repair

Alexander Beletsky, B.A., Benedict U. Nwachukwu, M.D., M.B.A., Brandon J. Manderle, M.D., Kelechi R. Okoroha, M.D., Brian Forsythe, M.D., Brian J. Cole, M.D., Nikhil N. Verma, M.D.

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Purpose
To examine the preoperative performance of the Patient-Reported Outcomes Measurement Information System (PROMIS) Upper Extremity (UE) Computer Adaptive Test (CAT) with respect to legacy scores in patients receiving rotator cuff repair (RCR). In addition, to define the impact of Workers' Compensation (WC) status on both performance and floor and ceiling effects.

Methods
The PROMIS UE CAT was administered preoperatively alongside legacy patient-reported outcome measures (PROMs) to patients undergoing isolated arthroscopic RCR from November 2017 to September 2018. Performance was assessed using Spearman correlation coefficients, and floor and ceiling effects were examined.

Results
One hundred twenty-two patients (WC, n = 32; non-WC, n = 90; 62.3% male, 53.6 ± 11.5 years) were included. PROMs assessing physical function (r = 0.41-0.77) correlated more strongly to the PROMIS UE CAT than did multidomain or mental health PROMs (r = 0.25-0.61). In WC patients, the PROMIS UE CAT demonstrated diminished correlative strength relative to shoulder function PROMs. WC patients also demonstrated relative floor effects for Single Assessment Numerical Evaluation (SANE; 18.8%) and Constant-Murley (15.6%) and relative ceiling effects for the Brief Resilience Scale (53.1%), Short Form 12 Mental Component Score (50%), and Veterans Rand 12 Mental Component Score (53.1%) and were more likely to report the minimum SANE score ($P < .01$) and the maximum Brief Resilience Scale score ($P < .01$). No absolute or relative floor/ceiling effects for the PROMIS UE CAT were found.

Conclusions
Compared with a non-WC cohort, WC patients have significantly lower preoperative PROMIS UE CAT scores, are more likely to report the absolute minimum and maximum scores for various PROMs, and demonstrated relative floor and ceiling effects for PROMs assessing mental health. The absence of significant floor/ceiling effects for the PROMIS UE CAT may suggest improved outcome discrimination and may support the adoption of PROMIS UE for the assessment of functional status in WC patients with rotator cuff pathology.

Level of Evidence
Level III, retrospective comparative trial.

BACK

Does an Increased Critical Shoulder Angle Affect Re-tear Rates and Clinical Outcomes Following Primary Rotator Cuff Repair? A Systematic Review

Andrew J. Sheean, M.D., Darren de SA, M.D., Taylor Woolnough, B.S., Daniel J. Cognetti, M.D., Jeffrey Kay, M.D., Stephen S. Burkhart, M.D.

Arthroscopy, Volume 35, Issue 10, Received: December 11, 2018; Accepted: March 25, 2019

https://doi.org/10.1016/j.arthro.2019.03.063

Purpose
To determine if an increased critical shoulder angle (CSA) predisposes patients to higher re-tear rates and worse clinical outcomes after rotator cuff (RC) repair.

Methods
A comprehensive search of the PubMed, MEDLINE, and EMBASE databases was performed in October 2018 for English-language studies pertaining to RC repair and an increased CSA in accordance with Preferred Reported Items for Systematic Reviews and Meta-analyses guidelines. Studies of all levels of evidence were included provided that any outcomes, including pain, patient-reported outcomes, and re-tear rates, were reported.

Results
Of a group of 1126 studies that satisfied the initial search criteria, 6 studies were included in the final analysis, comprising data from 473 patients. Three comparative studies were assessed for an association between increased CSA and RC re-tear rates. Among these 3 studies that compared RC re-tear rate in patients with larger and smaller CSAs, 22 of 97 patients (23%) with a larger CSA had a RC re-tear in comparison to 10 of 99 patients (10%) with a smaller CSA. All 3 studies demonstrated higher RC re-tear rates in patients with larger CSAs (risk ratio, 2.39-9.66, I2 = 7%.) The mean CSA in those patients who did not have RC re-tears ranged from 34.3° to 37°, and the mean CSA in those patients who had RC re-tears ranged from 37° to 40°.

Conclusion
RC re-tear rates were higher in patients with larger CSAs among comparative, nonrandomized studies. However, the heterogeneity of the relevant literature limits the strength of his observation. Based on the current literature, it remains unclear as to whether lateral acromioplasty affects clinical outcomes as a function of a reduced postoperative CSA.

Level of Evidence
Level IV, systematic review of Level II to IV studies.

BACK

Journal of Shoulder and Elbow Surgery (JSES), Volume 28, issue 10

Rotator cuff tendon tissue cut-through comparison between 2 high–tensile strength sutures

Brett D. Owens, Joseph Algeri, Vivian Liang, Steven DeFroda

DOI: https://doi.org/10.1016/j.jse.2019.02.028

Background
High–tensile strength sutures are known to cut through tendon tissue when used for rotator cuff and other tendon repairs, resulting in mechanical failure. The purpose of this study was to test a new suture and compare it with an established suture in a controlled laboratory setting.

Methods
Two sutures, Dynacord and FiberWire, both USP size No. 2, were passed through fresh infraspinatus tendons from 7 matched pairs of ovine shoulders (14 shoulders). Samples underwent cyclic testing for 1000 cycles, and the amount of cheese-wire tissue damage (tendon cut-through) was recorded. A clinical failure was defined as greater than 5 mm of tissue cut-through.

Results
The mean amount of tendon cut-through was 3.72 ± 1.14 mm in the FiberWire specimens and 2.69 ± 1.02 mm in the Dynacord group. The difference was statistically significant (P = .012). In the matched-pair analysis, more tendon cut-through was noted with FiberWire in 13 specimens whereas a greater amount was found in only 1 Dynacord specimen. The FiberWire specimens showed 2 instances of tissue tendon cut-through exceeding 5 mm, defined as a clinical failure.

Conclusions
In this cadaveric ovine rotator cuff tendon model, we found less tendon cut-through from Dynacord suture compared with FiberWire. In addition, 2 of the FiberWire specimens showed complete tendon cut-through. Future studies focusing on patient-reported outcomes and healing rates with different types of suture materials are needed.

Level of evidence:
Basic Science Study, Biomechanics

BACK

Fluid retention after shoulder arthroscopy: gravity flow vs. automated pump—a prospective randomized study

Bilgehan Çatal, İbrahim Azboy

DOI: https://doi.org/10.1016/j.jse.2019.05.041

Background
Soft tissue fluid retention due to irrigation is relatively common after shoulder arthroscopy. The objective of this study was to compare fluid retention of 2 irrigation systems of shoulder arthroscopy: gravity flow irrigation and automated pump.

Methods
Patients undergoing shoulder arthroscopy were enrolled prospectively and randomized into 2 groups using gravity flow system (GFS) or automated pump system (APS) for irrigation. Net weight gain was the primary outcome measurement to determine periarticular fluid retention. Change in deltoid diameter and postoperative pain were also compared.

Results
Forty-two patients were included in the study. There were no statistically significant differences between the GFS and APS groups regarding demographics, surgical procedures, duration of surgery, or the amount of irrigation fluid used. The APS group had greater weight gain per hour (1.46 ± 0.36 kg/h vs. 1.1 ± 0.38 kg/h) than the GFS group. A strong correlation was found between the amount of fluid used and the weight gain in both the GFS and APS groups. But a strong correlation between duration of surgery and weight gain was found in the APS group only. The APS group also had a greater mean deltoid diameter increase (3.33 ± 1.56 cm vs. 2.1 ± 1.44 cm) and a higher postoperative first-hour visual analog pain scale score (5.81 ± 2 vs. 3.62 ± 1.6).

Conclusion
APS causes more fluid retention than GFS in shoulder arthroscopy when used for equal duration in similar procedures. Use of APS, prolongation of surgery, and increased amounts of irrigation fluid increase weight gain as a result of fluid retention.

Level of evidence:
Level I, Randomized Controlled Trial, Treatment Study

BACK

Prospective randomized controlled trial for patch augmentation in rotator cuff repair: 24-month outcomes

Paolo Avanzi, Luca dei Giudici, Antonio Capone, Gaia Cardoni, Gianluigi Lunardi, Giovanni Foti, Claudio Zorzi

DOI: https://doi.org/10.1016/j.jse.2019.05.043

Background
To evaluate the anatomic integrity of rotator cuff repair performed by medialized single row and augmented by a porcine dermal patch, in comparison with a nonaugmented group.

Methods
We conducted a single-center, prospective, double-blinded, randomized controlled trial. The sample size was predefined, and patients were divided into a study group and a control group, assessed preoperatively and at 1, 3, 6, 12, and 24 months. The EuroQol–visual analog scale; Constant-Murley questionnaire; Disabilities of the Arm, Shoulder and Hand Score; and Simple Shoulder Test were administered. The humeral-acromial distance was calculated on radiographs. Tendon thickness, tear extension, and tendon signal intensity were all measured on magnetic resonance images (MRIs) along with an evaluation of footprint extension and a classification into one of 4 healing grades—healed, thinned, partially healed, not healed.

Results
The study population consisted of 92 patients who were equally randomized into 2 homogenous groups. Sixty-nine patients completed the 24-month follow-up. The study group showed a healing rate of 97.6% compared with 59.5% for the standard repair group. The study group showed better results in terms of repaired tendon thickness and footprint coverage, with a P value < .05, although the tendon density was comparable. The study group showed better strength recovery and functionality with the outcome scores submitted. During the entire study, only 2 patients reported complications, calling for a biopsy during revision surgery.

Conclusions
Rotator cuff repairs augmented with a porcine dermal patch resulted in excellent clinical outcomes with a higher healing rate and close-to-normal MRI findings. The technique is safe and effective; in addition, it is reproducible and allows for better outcomes compared with those of standard medialized single-row repairs.

Level of evidence:
Level II, Randomized Controlled Trial, Treatment Study

BACK

Arthroscopy of the symptomatic shoulder arthroplasty

Ciaran Doherty, Nicholas D. Furness, Timothy Batten, William J. White, Jeffrey Kitson, Christopher D. Smith

DOI: https://doi.org/10.1016/j.jse.2019.02.027

Background
Assessment of a painful or stiff shoulder arthroplasty can be challenging. The cause of pain can sometimes be easily identified. However, some patients have normal levels of inflammatory markers, normal plain films, and no clinical signs to indicate a diagnosis. Indolent organisms may not raise blood marker levels or result in obvious radiologic findings such as loosening. We report the utility of performing arthroscopy in these patients for a diagnostic advantage.

Methods
We retrospectively reviewed the health records of all patients who underwent diagnostic shoulder arthroscopy over a 3-year period. Patients were included if they were aged 18 years or older, had undergone previous arthroplasty surgery, and had symptoms of shoulder pain or stiffness. Patients were excluded if they had any traditional symptoms of infection or had a raised serum white cell count or C-reactive protein level prior to diagnostic arthroscopy.

Results
Fourteen patients met the initial inclusion criteria. The mean interval between index surgery and arthroscopic evaluation was 65.4 months (standard deviation, 58 months; range, 17-192 months). Arthroscopic biopsy specimens returned positive culture results in 3 patients (21%). Rotator cuff tears were noted in 8 patients (57%). Capsular contraction requiring release was noted in 2 patients (10%). In all patients, the diagnostic arthroscopy directed the next stage of management.

Conclusions
Diagnostic arthroscopy allows a full assessment of implants, the rotator cuff, the native articular surfaces, and scar tissue, as well as biopsy specimens to be obtained for indolent infection, in patients considering revision arthroplasty surgery. This allows a more informative consent process for patients, directs surgical management, and on occasion, allows for therapeutic intervention in a painful or stiff shoulder arthroplasty.

Level of evidence:
Level IV, Case Series, Treatment Study

BACK

The primary cost drivers of arthroscopic rotator cuff repair surgery: a cost-minimization analysis of 40,618 cases

Lambert Li, Steven L. Bokshan, Lauren V. Ready, Brett D. Owens

DOI: https://doi.org/10.1016/j.jse.2019.03.004

Background
An estimated 250,000 rotator cuff repair (RCR) surgical procedures are performed every year in the United States. Although arthroscopic RCR has been shown to be a cost-effective operation, little is known about what specific factors affect the overall cost of surgery. This study examines the primary cost drivers of RCR surgery in the United States.

Methods
Univariate analysis was performed to determine the patient- and surgeon-specific variables for a multiple linear regression model investigating the cost of RCR surgery. The 2014 State Ambulatory Surgery and Services Databases were used, yielding 40,618 cases with Current Procedural Terminology code 29827 (“arthroscopic shoulder rotator cuff repair”).

Results
The average cost of RCR surgery was $25,353. Patient-specific cost drivers that were significant under multiple linear regression included black race ($P < .001$), presence of at least 1 comorbidity ($P < .001$), income quartile ($P < .001$), male sex ($P = .012$), and Medicare insurance ($P = .035$). Surgical factors included operative time ($P < .001$), use of regional anesthesia ($P < .001$), quarter of the year (January to March, April to June, July to September, and October to December) ($P < .001$), concomitant subacromial decompression or distal clavicle excision ($P < .001$), and number of suture anchors used ($P < .001$). The largest cost driver was subacromial decompression, adding $4992 when performed alongside the RCR.

Conclusion
There are several patient-specific variables that can affect the cost of RCR surgery. There are also surgeon-controllable factors that significantly increase cost, most notably subacromial decompression, distal clavicle excision, use of regional anesthesia, and number of suture anchors. Surgeons must consider these factors in an effort to minimize cost, particularly as bundled payments become more common.

Level of evidence:
Level IV, Economic Analysis

BACK

Arthroscopic glenoid labral lesion repair using all-suture anchor for traumatic anterior shoulder instability: short-term results

Orkun Gül,, Ahmet Emin Okutan, Muhammet Salih Ayas

DOI: https://doi.org/10.1016/j.jse.2019.03.003

Background
This study presents the preliminary clinical results of arthroscopic glenoid labral lesion repair using all-suture anchors in the treatment of recurrent traumatic anterior shoulder instability.

Methods
Seventy patients who underwent arthroscopic shoulder stabilization for traumatic anterior shoulder instability were evaluated in this single center–based retrospective study. Patients with a glenoid defect greater than 20%, off-track engaging Hills-Sachs lesion, multidirectional instability, and generalized ligamentous laxity were excluded. The 62 included patients treated with arthroscopic glenoid labral lesion repair using all-suture anchors were evaluated. The Rowe and Constant scores were used to assess the results.

Results
We evaluated 62 patients with a mean age of 26.7 ± 12 years. The mean Rowe and Constant scores were 35 ± 7.2 and 65 ± 6.3, respectively, preoperatively and increased to 93.6 ± 5.3 and 92 ± 4.3, respectively, postoperatively at the mean follow-up of 28.8 months (range, 24-48 months) ($P < .001$). The redislocation rate was 8.1%. Of the patients, 91.9% had good to excellent clinical scores. Younger age and contact sports were associated with a higher risk of recurrent dislocation ($P = .012$ and $P = .041$, respectively). The postoperative functional results were not significantly correlated with the findings concerning the number of dislocations, time until surgery, degree of anterior translation, and number of anchors.

Conclusion
The use of all-suture anchors for arthroscopic glenoid labral lesion repair for the treatment of recurrent traumatic anterior shoulder instability yields satisfactory clinical results and is a safe and effective option.

Level of evidence:
Level IV, Case Series, Treatment Study

BACK

Surgical outcomes for post-traumatic stiffness after elbow fracture: comparison between open and arthroscopic procedures for intra- and extra-articular elbow fractures

Jae-Man Kwak, Yucheng Sun, Erica Kholinne, Kyoung-Hwan Koh, In-Ho Jeon

DOI: https://doi.org/10.1016/j.jse.2019.06.008

Hypothesis
We hypothesized that arthroscopic osteocapsular arthroplasty has a comparable outcome to that of the corresponding open procedure.

Methods
Patients treated with osteocapsular arthroplasty for post-traumatic stiffness were assigned to open procedure (OPEN) and arthroscopic procedure (ARTHRO) groups. The clinical outcomes were measured based on range of motion (ROM), Mayo Elbow Performance Score (MEPS), and visual analog scale (VAS) score. Based on the initial trauma, the patients were grouped into either intra-articular fracture (I) or extra-articular fracture (E) groups, followed by comparison of the 2 groups.

Results
The overall, ROM, VAS, and MEPS scores showed improvement in both groups. Preoperative VAS scores improved from 6.6 ± 1.4 to 2.2 ± 0.9 following OPEN and from 6.5 ± 1.2 to 2.1 ± 1.0 following ARTHRO. Preoperative flexion improved from 88° ± 14° to 113° ± 17° following OPEN and from 102° ± 15° to 122° ± 8° following ARTHRO. Preoperative extension improved from 36° ± 14° to 17° ± 12° following OPEN and from 30° ± 8° to 15° ± 7.4° following ARTHRO. Preoperative MEPS improved from 48.9 ± 11.5 to 80.0 ± 14.8 following OPEN and from 52.3 ± 12.2 to 80.8 ± 7.9 following ARTHRO. All values for the clinical outcomes were worse in group I than in group E.

Conclusions
Arthroscopic osteocapsular arthroplasty is comparable to the corresponding open procedure with regard to the use of our indications. The clinical outcomes in the intra-articular fracture group as a previous trauma were worse than those in the extra-articular fracture group.

Level of evidence:
Level III, Retrospective Cohort Design, Treatment Study

BACK

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA), Volume 27, Issue 10

Anatomic ligament consolidation of the superior acromioclavicular ligament and the coracoclavicular ligament complex after acute arthroscopically assisted double coracoclavicular bundle stabilization

S. Jobmann, J. Buckup, C. ColcucP. P. Roessler, E. Zimmermann, K. F. Schüttler, R. Hoffmann, F. Welsch, T. Stein

DOI https://doi.org/10.1007/s00167-017-4717-1

Purpose
The consolidation of the acromioclavicular (AC) and coracoclavicular (CC) ligament complex after arthroscopically assisted stabilization of acute acromioclavicular joint (ACJ) separation is still under consideration.

Methods
Fifty-five consecutive patients after arthroscopically assisted double-CC-bundle stabilization within 14 days after acute high-grade ACJ separation were studied prospectively. All patients were clinically analysed preoperatively (FU0) and post-operatively (FU1 = 6 months; FU2 = 12 months). The structural MRI assessments were performed at FU0 (injured ACJ) and at FU2 bilateral (radiologic control group) and assessed separately the ligament thickness and length at defined regions for the conoid, trapezoid and the superior AC ligament.

Results
Thirty-seven patients were assessed after 6.5 months and after 16.0 months. The 16-month MRI analysis revealed for all patients continuous ligament healing for the CC-complex and the superior AC ligament with in the average hypertrophic consolidation compared to the control side. Separate conoid and trapezoid strands (double-strand configuration) were detected in 27 of 37 (73%) patients, and a single-strand configuration was detected in 10 of 37 (27%) patients; both configurations showed similar CCD data. The ligament healing was not influenced by the point of surgery, age at surgery and heterotopic ossification. The clinical outcome was increased (FU0–FU2): Rowe, 47.7–97.0 pts.; TAFT, 3.9–10.6 pts.; NAS pain, 8.9–1.4 pts. (all $P < 0.05$).

Conclusion
The arthroscopically assisted double-CC-bundle stabilization within 14 days after acute high-grade ACJ separation showed 16 months after surgery sufficient consolidations of the AC and double-CC ligament complex in 73%.

Level of evidence
III, Case series.

BACK

Double-row rotator cuff repairs lead to more intensive pain during the early postoperative period but have a lower risk of residual pain than single-row repairs

Yuzhou Chen, Hong Li, Yang Qiao, Yunshen Ge, Yunxia Li, Yinghui Hua, Jiwu Chen, Shiyi Chen

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Purpose
The purpose of this study is to compare pain patterns and identify factors associated with residual shoulder pain after rotator cuff repairs using double-row and single-row techniques.

Methods
A cohort study was performed using patients who underwent arthroscopic rotator cuff repairs at our center in 2015. Patients were allocated according to the repair technique into an single-row (SR) group or a double-row (DR) group. Visual Analog Scale (VAS) scores for pain were assessed at 1 week, 3 months, 6 months, 12 months and 24 months after surgery. Functional and radiographic assessments were performed at least 24 months postoperatively. The proportion of patients with residual pain and factors associated with residual shoulder pain (VAS > 0 at the final follow-up) were analyzed in both groups.

Results
Fifty-two patients were enrolled in the SR group, and 53 were enrolled in the DR group. The DR group appeared to have higher levels of pain 1 week ($P < 0.001$) and 3 months ($P = 0.041$) postoperatively, while at other time points, the pain intensity of the two groups was comparable. Fourteen (26.4%) and 25 (48.1%) patients in the DR and the SR groups, respectively, developed residual shoulder pain, ($P = 0.022$; RR 1.82). The univariate analysis and multiple regression revealed that a poorer quality of tendon tissue is related to residual pain in the SR group, whereas tendon retraction is associated with residual pain in the DR group. The rate of re-tear was similar between the two groups and between patients with and without residual pain.

Conclusions
The DR repair technique results in a greater intensity of pain than that of SR repair during the first 3 months after surgery; however, patients who underwent DR repair presented a significantly lower proportion of residual shoulder pain and better tendon quality after 2 years. Poorer tendon quality and larger tendon retraction as determined intraoperatively were risk factors for residual pain. These results highlight the necessity of promoting healing on the grounds of residual pain prevention.

Level of evidence
II.

BACK

No healing improvement after rotator cuff reconstruction augmented with an autologous periosteal flap

C. Holwein,B von Bibra, M. Jungmann, D. C. Karampinos, K. Wörtler, M. Scheibel, A. B. Imhoff, S. Buchmann

DOI https://doi.org/10.1007/s00167-019-05384-8

Purpose
To show descriptive clinical and magnetic resonance (MR) imaging results after an additional periosteal flap augmentation in mini-open rotator cuff reconstruction and to evaluate potential healing improvement at long-term follow-up.

Methods
Twenty-three patients with degenerative rotator cuff tears were followed after receiving a mini-open single-row repair with a subtendinous periosteal flap augmentation. Data were collected preoperatively, after 12 months and after 11 years. Clinical examination, simple shoulder test (SST), Constant–Murley Score (CS), ultrasonography examination and 3T MR imaging were performed.

Results
Out of 23 patients, 20 were available for short-term and 19 for final follow-up at a median of 11.5 years (range 10.4–13.0). Questions answered with “yes” in SST improved from baseline 5.0 (range 1.0–8.0) to short 10.5 (range 8.0–12.0) and final follow-up 12.0 (range 7.0–12.0). CS improved from 53.5 (range 25.0–66.0) to 80.8 (range 75.9–89.3) and finally to 79.8 points (range 42.3–95.4). Improvement was highly significant ($p < 0.05$). Severe retears were found in 9/19 patients. Ossifications along the refixed tendon were noticed in 8/19 cases. Ossifications did not correlate with clinical outcome. At final follow-up, patients with retears seemed likely to have lower strength values in CS (mean ± SD) than patients without retears (7.3 ± 4.1 vs. 12.8 ± 5.3; $p < 0.05$).

Conclusion
No positive effect on improving healing response in rotator cuff refixation with a periosteal flap augmentation could be found. Retear rate is comparable to that of conventional rotator cuff refixation in the published literature. Ossifications along the tendon, without negatively affecting the clinical outcome, were seen. This invasive technique cannot be advised and should not be used anymore.

Level of evidence
IV.

BACK

Intraoperative graft-related complications are a risk factor for recurrence in arthroscopic Latarjet stabilisation

Bartłomiej Kordasiewicz, Konrad Małachowski, Maciej Kiciński, Sławomir Chaberek, Andrzej Boszczyk, Dariusz Marczak, Stanisław Pomianowski

DOI https://doi.org/10.1007/s00167-019-05400-x

Purpose
The goal of this study was to evaluate clinical and radiological outcomes after arthroscopic Latarjet stabilisation in anterior shoulder instability.

Methods
Ninety-three patients after primary arthroscopic Latarjet stabilisation were reviewed. Satisfaction, subjective shoulder value (SSV), Walch–Duplay and Rowe scores, and range of motion and stability were evaluated on clinical examination. Computed tomography (CT) was used to analyse graft position and fusion.

Results
Ninety patients (96.8%) were available for clinical and 85 for CT evaluation. The mean follow-up was 23.7 months (13–50, SD 7.1) and age at surgery was 26.2 years (16–44, SD 5.6). Intraoperative complications were reported in eight patients (8.9%) and recurrence in three (3.3%). Significantly, two out of three patients with recurrence had intraoperative graft complications ($p = 0.0107$). Forty-one patients (45.6%) reported the feeling of “subjective return to sport anxiety”. External rotation with arm at the side was 59° (10–90°, SD 20) with 15° (0–70°, SD 17) of loss of rotation. These two factors correlated with results the most. Patient satisfaction was evaluated as 92% (40–100, SD 14) and SSV 90% (30–100, SD12). Revision rate after primary surgery was 10%. CT showed graft healing in 81 (95.3%) patients. A graft position between 2 and 5 o’clock was found in 70 (83.4%) patients and flush to the anterior glenoid rim in 34 (40.5%). Osteolysis of the superior part of the graft was found in 55 (64.7%) patients. CT evaluation showed no correlation with clinical results.

Conclusion
Arthroscopic Latarjet stabilisation demonstrates satisfactory results in short-term follow-up; however, intraoperative graft-related complications are a risk factor for recurrence. “Subjective return to sport anxiety” and loss of external rotation with the arm at the side are factors worsening the results. Graft position imperfections and osteolysis of the superior part of the graft reported in CT evaluation do not influence the clinical results.

BACK

Arthroscopic repair of HAGL lesions yields good clinical results, but may not allow return to former level of sport

Uli Schmiddem, Adam Watson, Diana Perriman, Emmanouil Liodakis, Richard Page

DOI https://doi.org/10.1007/s00167-019-05414-5

Purpose
There is a paucity of evidence regarding mid- to long-term clinical outcomes of arthroscopic repair of humeral avulsion of the glenohumeral ligament (HAGL). This study investigated clinical outcomes, return to sport and the frequency of associated shoulder lesions.

Methods
Eighteen patients underwent arthroscopic repair of a HAGL lesion between 2008 and 2015. Clinical outcome was evaluated using the Rowe Score, the Quick DASH Score (Q-DASH), the Oxford Shoulder Instability Score (OSIS), the ASES Score and Range of Motion (ROM). Return to sports and associated shoulder lesions were documented.

Results
Sixteen patients agreed to complete the shoulder scores and nine patients were available for clinical examination. Median time to follow-up was 59 months (range 16–104). The median Rowe Score and Q-DASH Score improved significantly from 33 to 85 points and 61 to 7 points, respectively ($p = 0.001$, $p = 0.001$). The median OSIS and ASES Score were 20 and 91 points. External rotation was significantly reduced compared to the contralateral side ($p = 0.011$). One recurrent dislocation was reported. No neurologic or vascular complications after surgery were reported. Five out of the nine patients did not return to sports at the same level. Associated shoulder lesions were found in 89% of the cases.

Conclusion
Arthroscopic repair of a HAGL lesion is a reliable method to restore shoulder stability with good clinical results. However, limitations in external rotation and a reduction in sporting ability may persist at 59 months follow-up. Concomitant lesions are common.

Level of evidence
Case series, level IV.

BACK

Locating the ulnar nerve during elbow arthroscopy using palpation is only accurate proximal to the medial epicondyle

Nick F. J. Hilgersom, Davide Cucchi, Francesco Luceri, Michel P. J. van den Bekerom, Luke S. Oh, Paolo Arrigoni, Denise Eygendaal

DOI https://doi.org/10.1007/s00167-018-5108-y

Purpose
Knowledge of ulnar nerve position is of utmost importance to avoid iatrogenic injury in elbow arthroscopy. The aim of this study was to determine how accurate surgeons are in locating the ulnar nerve after fluid extravasation has already occurred, and basing their localization solely on palpation of anatomical landmarks.

Methods
Seven cadaveric elbows were used and seven experienced surgeons in elbow arthroscopy participated. An arthroscopic setting was simulated and fluids were pumped into the joint from the posterior compartment for 15 min. For each cadaveric elbow, one surgeon was asked to locate the ulnar nerve solely by palpation of the anatomical landmarks, and subsequently pin the ulnar nerve at two positions: within 5 cm proximal and another within 5 cm distal of a line connecting the medial epicondyle and the tip of the olecranon. Subsequently, the elbows were dissected using a standard medial elbow approach and the distances between the pins and ulnar nerve were measured.

Results
The median distance between the ulnar nerve and the proximal pins was 0 mm (range 0–0 mm), and between the ulnar nerve and the distal pins was 2 mm (range 0–10 mm), showing a statistically significant difference ($p = 0.009$). All seven proximally placed pins (100%) transfixed the ulnar nerve versus two out of seven distally placed pins (29%) ($p = 0.021$).

Conclusions
In a setting simulating an already initiated arthroscopic procedure, the sole palpation of the anatomical landmarks allows experienced elbow surgeons to accurately locate the ulnar nerve only in its course proximal to the medial epicondyle (7/7, 100%), whereas a significantly reduced accuracy is documented when the same surgeons attempt to locate the nerve distal to the medial epicondyle (2/7, 29%; $p = 0.021$). Current findings support the establishment of a proximal anteromedial portal over a distal anteromedial portal to access the anterior compartment after tissue extravasation has occurred with regard to ulnar nerve safety.

BACK

Modified anteromedial and anterolateral elbow arthroscopy portals show superiority to standard portals in guiding arthroscopic radial head screw fixation

Davide Cucchi, Paolo Arrigoni, Francesco Luceri, Alessandra Menon, Enrico Guerra, Lars Peter Müller, Christof Burger, Denise Eygendaal, Kilian Wegmann

DOI https://doi.org/10.1007/s00167-019-05411-8

Purpose
Arthroscopic fixation of radial head radial head fractures is an appealing alternative to open reduction and internal fixation, which presents the advantage of minimal surgical trauma. The aim of this study was to evaluate if modifications to the standard anteromedial (AM) and anterolateral (AL) portals could allow screw placement for radial head fracture osteosynthesis closer to the plane of the radial head articular surface.

Methods
Eight fresh-frozen specimens were prepared to mimic arthroscopic setting. Standard AL (ALst) and AM (AMst) and distal AL (ALdi) and AM (AMdi) portals were established. Eleven independent examiners were asked to indicate the optimal trajectory, when aiming to place a cannulated screw parallel to the radial head surface for radial head osteosynthesis. A three-dimensional digital protractor was used to measure the angle between the indicated position and a Kirschner wire placed parallel to the radial head articular surface (α). The Shapiro–Wilk normality test was used to evaluate the normal distribution of the samples. Means, standard deviations, and 95% confidence intervals (95% CI) were calculated for each portal. A coefficient of variation (CoV) was calculated to determine agreement among observers and intra-observer variability.

Results
Mean α angles were 25.1 ± 11.5° for AMst, 13.8 ± 4.8° for AMdi, 17.1 ± 13.4° for ALst, -2.6 ± 9.2° for ALdi. No overlapping in the 95% CI of ipsilateral standard and distal portals was observed, indicating that the difference between these means was statistically significant. The distal portals showed smaller inter-observer CoV as compared to the standard ones (AMst: 10.0%; AMdi: 4.6%; ALst: 12.5%; ALdi: 10.6%). Intra-observer CoV was similar for all portals (AMst: 5.5%; AMdi: 6.1%; ALst: 7.7%; ALdi: 7.1%).

Conclusions
The use of distal AM and AL portals permits to obtain α angles closer to the radial head articular surface than standard AM and AL portals. This is expected to allow screw placement in a flatter trajectory, which should correlate with a superior biomechanical performance of fixation. Good reproducibility of Kirschner wire placement from distal portals was observer among different examiners. Modifications to the standard AM and AL elbow arthroscopy portals allow to place screws for radial head fracture osteosynthesis in a position which should guarantee superior biomechanical performance of fixation.

BACK

Lower Extremity

Arthroscopy, Volume 35, Issue 10

Traction Time, Force and Postoperative Nerve Block Significantly Influence the Development and Duration of Neuropathy Following Hip Arthroscopy

Travis L. Bailey, M.D., Andrew R. Stephens, B.S., Temitope F. Adeyemi, M.P.H., Yizhe Xu, M.S., Angela P. Presson, Ph.D., Stephen K. Aoki, M.D., Travis G. Maak, M.D.

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Purpose
To (1) evaluate the individual and combined effects of traction time and traction force on postoperative neuropathy following hip arthroscopy, (2) determine if perioperative fascia iliaca block has an effect on the risk of this neuropathy, and (3) identify if the these items had a significant association with the presence, location, and/or duration of postoperative numbness.

Methods
Between February 2015 and December 2016, a consecutive cohort of hip arthroscopy patients was prospectively enrolled. Traction time, force, and postoperative nerve block administration were recorded. The location and duration of numbness were assessed at postoperative clinic visits. Numbness location was classified into regions: 1, groin; 2, lateral thigh; 3, medial thigh; 4, dorsal foot; and 5,preoperative thigh or radiculopathic numbness.

Results
A total of 156 primary hip arthroscopy patients were analyzed, 99 (63%) women and 57 (37%) men. Mean traction time was 46.5 ± 20.3 minutes. Seventy-four patients (47%) reported numbness with an average duration of 157.5 ± 116.2 days. Postoperative fascia iliaca nerve block was a significant predictor of medial thigh numbness (odds ratio, 3.36; 95% confidence interval, 1.46-7.76; P = .04). Neither traction time nor force were associated with generalized numbness (P = .85 and P = .40, respectively). However, among those who experienced numbness, traction time and force were greater in patients with combined groin and lateral thigh numbness compared with those with isolated lateral thigh or medial thigh numbness (P = .001 and P = .005, respectively).

Conclusions
Postoperative neuropathy is a well-documented complication following hip arthroscopy. Concomitant pudendal and lateral femoral cutaneous nerve palsy may be related to increased traction force and time, even in the setting of low intraoperative traction time (<1 hour). Isolated medial thigh numbness is significantly associated with postoperative fascia iliaca blockade.

Level of Evidence
IV, case series.

BACK

Return to Basketball After Hip Arthroscopy: Minimum 2-Year Follow-up

Austin W. Chen, M.D., Matthew J. Craig, M.D., Brian H. Mu, B.S., Cammille C. Go, B.S., Victor Ortiz-Declet, M.D., David R. Maldonado, M.D., Benjamin G. Domb, M.D.

Arthroscopy, Volume 35, Issue 10

https://doi.org/10.1016/j.arthro.2019.04.029

Purpose
To present minimum 2-year patient-reported outcomes (PROs) and return to sport (RTS) data for a population of basketball players after hip arthroscopy.

Methods
Data were prospectively collected and retrospectively reviewed for all patients who underwent hip arthroscopy between February 2009 and May 2014. Patients with preoperative and minimum 2-year postoperative PROs, visual analog scale score for pain, and satisfaction, who regularly played basketball within 1 year before surgery, and who attempted to RTS met the inclusion criteria. Exclusion criteria were previous ipsilateral hip surgery or conditions such as fracture, dysplasia, or femoral avascular necrosis. Patients were matched 1:1 to a control group composed of those who did not play any sports before surgery, based on the following matching criteria: age ±5 years, sex, and body mass index ±5. Statistical analysis was performed to determine significant differences in PROs. Conversion to total hip arthroplasty (THA) was considered an endpoint.

Results
Thirty-one patients (81.6%) met inclusion criteria with follow-up of 46.8 ± 20.6 months. The mean age was 30.0 ± 12.3, and the mean body mass index was 26.3 ± 6.5. Male patients (64.5%) outnumbered female patients (35.5%). A majority of the players (54.8%) identified themselves as recreational athletes; the remainder competed at the high school, collegiate, amateur, or professional level. There was significant ($P < .001$) improvement in all PRO measures and visual-analog scale scores from baseline to a minimum 2-year follow-up. At the most recent follow-up, mean patient satisfaction was 8.1 ± 2.1. Twenty-two (78.6%), and 23 patients (82.1%) achieved the patient acceptable symptom state on the modified Harris Hip Score and the Hip Outcomes Score–Sports Specific Subscale. Twenty-one (75.0%) and 17 (60.7%) patients had a minimal clinically important difference on the modified Harris Hip Score and the Hip Outcomes Score–Sports Specific Subscale, respectively. Three patients (9.7%) with an average age of 47.5 ($P = .023$) converted to THA at a mean of 35.9 ± 7.2 (range 29.66-43.75) months after arthroscopy. At the most recent follow-up, the RTS rate was 83.9%. Subjective ability level was the same or higher in 23 patients (74.2%).

Conclusion
Hip arthroscopy in basketball athletes demonstrates a significant increase in PROs, a high RTS rate, and a low risk of complications. Hip arthroscopy may be considered in basketball players <40 years old for whom nonoperative treatment fails and who have a significantly limited level of play. Careful patient selection and counseling should be used when considering hip arthroscopy in basketball players >40 years old because there may be a high rate of conversion to THA.

Level of Evidence
Level III, retrospective comparative study.

BACK

A Shift in Hip Arthroscopy Use by Patient Age and Surgeon Volume: A New York State–Based Population Analysis 2004 to 2016

William W. Schairer, M.D., Benedict U. Nwachukwu, M.D., M.B.A., Joash R. Suryavanshi, B.A., Yi-Meng Yen, M.D., Ph.D., Bryan T. Kelly, M.D., M.B.A., Peter D. Fabricant, M.D., M.P.H.

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Purpose
To perform a population-level analysis of the shifts in use of hip arthroscopy by different age groups and to describe the proportion of hip arthroscopy procedures performed by high-volume surgeons.

Methods
The Statewide Planning and Research Cooperative System database was combined with New York State census data to calculate changes in annual hip arthroscopy incidence by age and gender (2004-16). Annual (January to January) surgeon volumes were calculated and stratified into 4 thresholds that have been associated with significant differences in revision hip surgery rates to calculate changes in hip arthroscopy rates by surgeon volume over time.

Results
There was a 495% increase in hip arthroscopies from 2004 to 2016, from 2.35 to 15.47 per 100,000 residents in New York State. The largest increase was in the 10-19 years age group—a 2,150% increase for female patients (= 1.26, $P < .001$) and a 1,717% increase for male patients (incident rate ratio = 1.21, $P < .001$). The number of labral repairs performed with femoroplasty increased 52.8% ($P < .001$). The number of hip arthroscopy surgeons increased from 3.4 to 6.5 per 1 million residents. The number of hip arthroscopies performed by high-volume surgeons increased from 0% in 2004 to 24.7% in 2016.

Conclusions
The use of hip arthroscopy has increased over the past 10 years, especially in the adolescent population ages 10-19. Over the same time period, there has been an emergence of high-volume hip arthroscopy surgeons and an increased proportion of procedures performed by these surgeons. Patients of high-volume surgeons tend to be younger, while lower volume surgeons tend to have older patients.

Level of Evidence
Level IV, case series.

BACK

Comparison Between 3-Dimensional Multiple-Echo Recombined Gradient Echo Magnetic Resonance Imaging and Arthroscopic Findings for the Evaluation of Acetabular Labrum Tear

Shota Higashihira, M.D., Naomi Kobayashi, M.D., Ph.D, Takayuki Oishi, M.D., Hyonmin Choe, M.D., Ph.D., Hiroyuki Ike, M.D., Ph.D., Taro Tezuka, M.D., Ph.D., Yutaka Inaba, M.D., Ph.D.

Arthroscopy, Volume 35, Issue 10

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Purpose
To evaluate radially reconstructed 3.0-Tesla 3-dimensional multiple-echo recombined gradient echo (MERGE) magnetic resonance imaging (MRI) without arthrography for the assessment of acetabular labrum tears, using arthroscopic evaluation as the reference standard.

Methods
A total of 71 consecutive hips, including 29 with femoroacetabular impingement, 26 with borderline developmental dysplasia of the hip, and 16 with early-stage osteoarthritis, were evaluated in this retrospective study. MERGE MRI findings were evaluated according to the modified Czerny classification for 3 regions of interest: anterior region, anterolateral region, and lateral region. Cases with severe degeneration that was not concordant with any stage in the original Czerny classification were defined as stage Ⅳ. MERGE MRI findings were compared with arthroscopic findings, and the sensitivity, specificity, positive predictive value, and negative predictive value in terms of the existence of labrum tears were calculated.

Results
MERGE MRI findings revealed labrum tears more frequently in the anterolateral region than in the anterior and lateral regions ($P < .01$). In cases of femoroacetabular impingement and borderline developmental dysplasia of the hip in particular, labrum tears were more frequently observed on MRI in the anterolateral region than in the lateral region ($P < .05$). In comparison with MRI findings and arthroscopic findings, our newly defined stage IV in the modified Czerny classification was more frequently observed in cases with a Multicenter Arthroscopy of the Hip Outcomes Research Network (MAHORN) classification of degenerative or complex ($P < .01$). The average sensitivity and specificity of all regions for the existence of labrum tears were 85% and 56%, respectively. Sensitivity and specificity were 79% and 50%, respectively, in the anterior region; 96% and 50%, respectively, in the anterolateral region; and 70% and 57%, respectively, in the lateral region.

Conclusions
We validated the diagnostic performance of 3.0-Tesla 3-dimensional MERGE MRI for evaluating acetabular labrum tears and made comparisons with arthroscopic findings. Radially reconstructed MERGE magnetic resonance images showed excellent sensitivity for the diagnosis of labrum tears, particularly in the anterolateral region. The newly defined stage IV was distinctive of early-stage osteoarthritis cases with degeneration and/or complex arthroscopic findings. The noninvasive imaging modality of radially reconstructed MERGE MRI may be an alternative to magnetic resonance arthrography for evaluating labrum tears.

Levels of Evidence
Level Ⅱ, development of diagnostic criteria.

BACK

Second-Look Arthroscopic Evaluations of Meniscal Repairs Associated With Anterior Cruciate Ligament Reconstruction

Ryo Kanto, M.D., Motoi Yamaguchi, M.D., Ph.D., Ken Sasaki, M.D., Ph.D., Akio Matsumoto, M.D., Ph.D., Hiroshi Nakayama, M.D., Ph.D., Shinichi Yoshiya, M.D., Ph.D.

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Purpose
To examine the healing status of meniscal repair performed concomitantly with anterior cruciate ligament (ACL) reconstruction with our current indication and surgical procedure based on second-look arthroscopic results. Additionally, the significance of the demographic and clinical factors that can potentially influence the healing rate was statistically assessed.

Methods
Between January 2009 and January 2015, second-look was performed for patients who opted to have tibial screw removal and agreed to have concomitant arthroscopy. The healing status of the repaired meniscus was classified into 3 conditions: healed, incompletely healed, and not healed. In addition, clinical outcomes were evaluated at a minimal 1-year follow-up. The effects of patient factors on the meniscal healing rate were statistically assessed.

Results
A total of 217 knees underwent arthroscopic meniscal repair concomitant with ACL reconstruction, while second-look was performed for 105 knees. The average period from index surgery to second-look was 15.0 months. Clinical evaluation was conducted at a mean of 17 months (12-50 months). Based on the second-look arthroscopic findings, 64 menisci, 22 menisci, and 29 menisci were categorized as healed, incompletely healed, and not healed, respectively. When the not healed condition was defined as failed repair, a Tegner activity score of 8 or more, recurrent instability, tears in the red-white to white-white zones, and time from injury to surgery of 4 months or longer were identified as clinical factors significantly correlated with failure ($P < .01$).

Conclusions
Meniscal repair in ACL reconstructed knees with expanded indications achieved a healing rate (including incomplete healing) of 75%. Clinical factors such as high sports activity level, recurrent ACL instability, poor vascularity of the repaired site, and long duration from injury to surgery were shown to impair the healing status.

Level of Evidence
Level Ⅳ, therapeutic study, case series.

BACK

Variability of the Composition of Growth Factors and Cytokines in Platelet-Rich Plasma From the Knee With Osteoarthritis

Chul-Won Ha, M.D., Ph.D., Yong-Beom Park, M.D., Ph.D., Jae Won Jang, M.D., Manyoung Kim, M.D., Jin-A. Kim, M.S., Yong-Geun Park, M.D., Ph.D.

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Purpose
To investigate the composition and concentration of growth factors and cytokines in platelet-rich plasma (PRP) with knee osteoarthritis and to explore the association of the concentration of growth factors and cytokines with the platelet count of PRPs.

Methods
Patients who visited outpatient clinic with symptomatic knee osteoarthritis (Kellgren-Lawrence grades 1 to 3) and had no blood dyscrasia were enrolled from October 2014 to March 2015. PRPs were obtained using a commercial system. Concentrations of growth factors and cytokines were measured with an enzyme-linked immunosorbent assay. Anabolic factors (platelet-derived growth factor [PDGF]-AA, -BB, and -AB, transforming growth factor-β, vascular endothelial growth factor [VEGF], epidermal growth factor [EGF], basic fibroblast growth factor [bFGF], and insulin-like growth factor 1), catabolic factors (interleukin [IL]-1β and matrix metalloproteinase 13), and catabolic blockers (IL-1 receptor antagonist) were included. The degree of variation was determined by coefficient of variation (CoV).

Results
105 patients were included. Growth factors and cytokines showed wide variation. bFGF showed the highest variation (CoV 78.45), and transforming growth factor-β1 showed the lowest variation (CoV 5.30). Platelet count in PRP showed a positive correlation with PDGF-BB and -AB, and VEGF ($r = 0.270$, $P = .005$; $r = 0.231$, $P = .018$; and $r = 0.200$, $P = .041$, respectively) and was negatively correlated with IL-1β ($r = –0.220$, $P = .025$).

Conclusion
Growth factors and cytokines in PRPs obtained from patients with knee osteoarthritis show a wide variation; the highest variation was shown in bFGF. Platelet counts associated positively with PDGF-AB and -BB and VEGF and negatively with IL-1β.

Clinical Relevance
This information leads to the concept that variation and association of specific factors needs to be taken into consideration for future investigations of PRPs in clinical application in patients with knee osteoarthritis.

BACK

A Magnetic Resonance Imaging Analysis of Shrinkage of Transplanted Fresh-Frozen Lateral Meniscal Allografts During a Minimum Follow-up of 8 Years

Jun-Gu Park, M.D., Seong-Il Bin, M.D., Ph.D., Jong-Min Kim, M.D., Ph.D., Bum-Sik Lee, M.D., Chang-Rack Lee, M.D., Dong-Wook Son, M.D., Sang-Min Lee, M.D.

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Purpose
To evaluate the incidence and degree of shrinkage of transplanted fresh-frozen meniscal allografts in a long-term period of >8 years and to investigate whether the shrinkage of allograft progresses and is associated with inferior clinical and radiologic outcomes after meniscal allograft transplantation (MAT) in the long term.

Methods
Twenty-two knees were reviewed in 20 patients (mean age, 31.41 ± 9.11 years) who underwent isolated lateral MAT. All patients were followed with magnetic resonance imaging (MRI) for at least 8 years (mean, 11.78 ± 3.10 years). The allograft widths of the anterior horn, mid-body, and posterior horn at 1 and >8 years postoperatively were measured by using MRI. To estimate the degree of shrinkage, the relative changes in widths during intervals were calculated. Patients were categorized into 4 groups according to shrinkage degree: minimal (<10%), mild (10%-25%), moderate (25%-50%), and severe (>50%). The joint space width was measured on the weightbearing radiographs to evaluate the radiologic outcome. The Lysholm score was used to evaluate the clinical outcome.

Results
The relative change in the width of the anterior horn, mid-body, and posterior horn, compared with that 1 year postoperatively, was 82.7% (95% confidence interval 77.4%-87.5%), 75.9% (70.7%-81.0%), and 85.0% (81.4%-88.5%), respectively. The shrinkage degree was greater at the mid-body than at the anterior and posterior horns. About 70% of allografts showed ≥10% shrinkage of the posterior horn. Meniscal shrinkage did not show significant correlation with clinical and radiologic outcome.

Conclusions
At long-term follow-up (>8 years), shrinkage of transplanted fresh-frozen meniscal allografts progressed at 1 year postoperative. On average, the shrinkage was mild and more prominent in the mid-body than in the anterior or posterior horn. In this study, it could not be concluded that the shrinkage of allografts was significantly associated with inferior clinical and radiologic outcomes in the long term.

Level of Evidence
Level IV, therapeutic case series.

BACK

Comparison of Clinical and Radiologic Outcomes Between Normal and Overcorrected Medial Proximal Tibial Angle Groups After Open-Wedge High Tibial Osteotomy

Kenichi Goshima, M.D., Ph.D, Takeshi Sawaguchi, M.D., Ph.D., Kenji Shigemoto, M.D., Shintaro Iwai, M.D., Ph.D., Kenji Fujita, M.D., Ph.D., Yuki Yamamuro, M.D.

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Purpose
To evaluate whether the overcorrected medial proximal tibial angle (MPTA) affects the clinical outcomes after open-wedge high tibial osteotomy (OWHTO) and to assess the correlation between knee joint line obliquity (KJLO) changes and the compensatory changes in the hip and ankle joints.

Methods
Consecutive patients who underwent OWHTO from July 2006 to August 2015 were included. Exclusion criteria were bilateral OWHTO and follow-up of <2 years. The patients were retrospectively divided into 2 groups according to postoperative MPTA; a normal group (MPTA <95°) and an overcorrected MPTA group (MPTA ≥95°). The groups were compared with respect to the clinical and radiologic outcomes after OWHTO. Clinical parameters, including Japanese Orthopedic Association (JOA) score, Oxford Knee Score (OKS), and Knee Injury and Osteoarthritis Outcome Score (KOOS), were evaluated. Radiologic outcomes, including the hip-knee-ankle angle (HKA), joint line convergence angle (JLCA), MPTA, KJLO, ankle joint line obliquity (AJLO), and hip abduction angle (HAA), were evaluated preoperatively and at the final follow-up.

Results
Ninety-four patients (normal group; n = 52, overcorrected group; n = 42) were included in this study. After OWTHO, the mean increases in HKA and MPTA were 11.0° ± 3.2° and 10.4° ± 2.7°, respectively, whereas the change in KJLO was only 3.7° ± 2.9°. The mean AJLO (4.3 ± 3.9 to −1.3 ± 3.3, P < .001) and HAA (3.7 ± 2.5 to −1.1 ± 2.3, P < .001) significantly decreased after OWHTO. The mean postoperative MPTA in the overcorrected group was 96.9° ± 1.5°, whereas the mean postoperative KJLO was only 3.1° ± 2.0°. No significant differences were noted in all clinical scores between the groups at the final follow-up.

Conclusions
A certain degree of overcorrected MPTA (≥95°) did not affect the clinical outcomes after OWHTO because of compensatory changes in the hip and ankle joints.

Level of Evidence
Level Ⅲ, retrospective comparative study.

BACK

Primary Medial Patellofemoral Ligament Repair Versus Reconstruction: Rates and Risk Factors for Instability Recurrence in a Young, Active Patient Population

Richard N. Puzzitiello, M.D., Brian Waterman, M.D., Avinesh Agarwalla, M.D., William Zuke, M.D., Brian J. Cole, M.D., M.B.A., Nikhil N. Verma, M.D., Adam B. Yanke, M.D., Ph.D., Brian Forsythe, M.D.

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Purpose
To comparatively evaluate the clinical outcomes and rates of recurrent instability in young patients with primary medial patellofemoral ligament (MPFL) repair or reconstruction, as well as to assess for radiologic risk factors for worse outcomes.

Methods
A retrospective review identified all patients with lateral patellar instability who underwent either MPFL repair and/or imbrication or MPFL reconstruction without any additional osseous procedures between 2008 and 2015 at a single center. Demographic variables and preoperative magnetic resonance imaging were analyzed, and Kujala scores were obtained at a minimum 2-year follow-up. Risk factors for worse outcomes were assessed, including the Caton-Deschamps Index (CDI) Insall-Salvati Index, tibial tubercle–trochlear groove distance, and tibial tubercle–posterior cruciate ligament distance.

Results
We identified 51 knees with isolated MPFL surgery (reconstruction in 32 and imbrication and/or repair in 19) at a mean of 59.7 months' follow-up (range, 24-121 months). The overall rate of recurrent dislocations was significantly greater in the repair group (36.9%) versus the reconstruction group (6.3%, P = .01), despite the average CDI being significantly higher in the reconstruction group (1.34 vs 1.23 in repair group, P = .04). No significant difference in the rate of return to baseline activity was found between the groups (77.8% in reconstruction group vs 70% in repair group, P = .62). The average Kujala score showed no significant difference between the repair and reconstruction groups (84.15 ± 14.2 vs 84.83 ± 14.38, P = .72). No imaging measurements were found to be predictive of a worse postoperative Kujala score; however, the average CDI among the MPFL repair failures (1.30 ± 0.05) was significantly higher than among the MPFL repair nonfailures (1.18 ± 0.12, P = .03).

Conclusions
MPFL reconstruction may provide improved midterm clinical outcomes and a decreased recurrence rate compared with MPFL repair. Increased patellar height as measured by the CDI may be a risk factor for recurrent patellar instability in patients who undergo isolated MPFL repair.

Level of Evidence
Level III, retrospective comparative study.

BACK

Study of the Nerve Endings and Mechanoreceptors of the Anterolateral Ligament of the Knee

Diego Ariel de Lima, M.D., Ph.D., Camilo Partezani Helito, M.D., Ph.D., Lana Lacerda de Lima, M.S., Ph.D., José Alberto Dias Leite, M.D., Ph.D., Maria Luzete Costa Cavalcante, M.D., Ph.D

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Purpose
To describe the morphology and distribution of the anterolateral ligament of the knee (ALL) nerve endings, aiming to understand the interaction between the proprioceptive system and knee mechanics.

Methods
Twenty ALLs were obtained from fresh frozen cadavers. The ligaments were measured, weighed, and cut. Sections (10 μm) were prepared in hematoxylin and eosin–stained slides to analyze tissue integrity, and 50-μm sections were subjected to immunofluorescence with the protein gene product 9.5 as primary antibody and Alexa Fluor 488 as secondary antibody, followed by microscopic analysis.

Results
The ALL was identified in 100% of the dissections, exhibiting a mean (± standard deviation) length of 4.0 ± 0.4 cm, a mean width of 5.5 ± 0.8 mm, and a mean weight of 0.9 ± 0.2 g. The histological sections in hematoxylin and eosin showed dense, well-organized collagen and the presence of vascular tissue. All the specimens analyzed contained type I (Ruffini-like) mechanoreceptors and free nerve endings (type IV), varying from parallel to intertwined fibers. Unclassified nerve endings with different irregular shapes were also found. The neural elements occupied 0.6% ± 0.3% of the ligament area, and most were observed near the origin of ALL insertions.

Conclusion
The ALL exhibits a peripheral nerve structure, primarily type I and IV mechanoreceptors. These findings suggest that the ALL is important for the proprioception and anterolateral stabilization of the knee.

Clinical Relevance
It is important to understand ALL innervation and infer how an injury could compromise the proprioceptive role of the lateral compartment, as the ligaments contribute dynamically to stability through proprioceptive control of muscle forces. The findings confirm that the ALL is highly innervated by mechanoreceptors and may have a proprioceptive role in conjunction with the lateral collateral ligament in the lateral region of the knee.

BACK

Vascular Compromising Effect of Drilling for Osteochondral Lesions of the Talus: A Three-Dimensional Micro–Computed Tomography Study

Dingyu Wang, M.D., Zhongcheng Shen, M.D.a,b, Xuan Fang, M.D., Chen Jiao, M.D., Qinwei Guo, M.D., Yuelin Hu, M.D., Jiakuo Yu, M.D., Ph.D., Dong Jiang, M.D., Weiguang Zhang, Ph.D.

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Purpose
To explore an optimal drilling depth and direction for osteochondral lesions of the talus based on a 3-dimensional vascular microarchitecture model constructed with micro–computed tomography (microCT).

Methods
Twelve tali were perfused with the contrast agent and then scanned with microCT. The talar dome was divided into 9 zones, and the vessel densities were measured at the subchondral depths of 0 to 5 mm, 5 to 10 mm and 10 to 15 mm in each zone. The anterolateral (AL) and posterolateral (PL) approaches of retrograde drilling were simulated and the vascular compromising effect was evaluated.

Results
The vessel density of the 0- to 5-mm depth was lower than that of the 5- to 10-mm ($P = .001$) and 10- to 15-mm ($P = .007$) depths, but no significant difference was found between the 5- to 10-mm and 10- to 15-mm depths ($P > .9999$). The vessel density in the 5- to 10-mm depth of medial talar dome was similar to that of the adjacent zones ($P = .05$). Vessel density in the 5- to 10-mm depth around the lateral talar dome was higher in the anterior and medial side. The anterolateral approach disturbed the main intraosseous vessels from the tarsal canal–tarsal sinus, causing extensive vascular compromise in the talus neck and body, whereas the posterolateral approach disturbed only the vessels near the tunnel.

Conclusions
The vessel density changed greatly from the subchondral 0- to 5-mm to the 5- to 10-mm depth. The vessel densities of the 5- to 10-mm depth around the medial talar dome were similar, whereas the anterior and medial side of the lateral talar dome was better vascularized. The posterolateral approach caused less vascular damage than the anterolateral approach.

Clinical Relevance
The anterograde drilling depth was preferable to the subchondral 5- to 10-mm depth. There was no preferred drilling direction for the osteochondral lesion in the medial talar dome, whereas it is preferable to drill anteriorly or medially in the lateral dome. The posterolateral approach might be a safer alternative for retrograde drilling.

BACK

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA), Volume 27, Issue 10

Athletes experience a high rate of return to sport following hip arthroscopy

Muzammil Memon, Jeffrey Kay, Philip Hache, Nicole Simunovic, Joshua D. Harris, John O'Donnell, Olufemi R. Ayeni

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Purpose
The purpose of this systematic review was to evaluate the rate at which patients return to sport following arthroscopic hip surgery.

Methods
The databases MEDLINE, EMBASE, and PubMed were searched by two reviewers, and titles, abstracts, and full-text articles screened in duplicate. English language studies investigating hip arthroscopy with reported return to sport outcomes were included. A meta-analysis of proportions was used to combine the rate of return to sports using a random effects model.

Results
Overall, 38 studies with 1773 patients (72% male), with a mean age of 27.6 years (range 11–65) and mean follow-up of 28.1 months (range 3–144) were included in this review. The pooled rate of return to sport was: 93% [95% confidence interval (CI) = 87–97%] at any level of participation; 82% (95% CI = 74–88%) at preoperative level of sporting activity; 89% (95% CI = 84–93%) for competitive athletes; 95% (95% CI = 89–98%) in pediatric patients; and 94% (95% CI 89.2–98.0%) in professional athletes. There was significant correlation between a shorter duration of preoperative symptoms and a higher rate of return to sports (Pearson correlation coefficient = − 0.711, p = 0.021).

Conclusion
Hip arthroscopy yields a high rate of return to sport, in addition to marked improvement in pain and function in the majority of patients. The highest rates of return to sport were noted in pediatric patients, professional athletes, and those with a shorter duration of preoperative symptoms. This study provides clinicians with evidence-based data on athletes' abilities to return to sport after arthroscopic hip surgery and identifies sub-populations with the highest rates of return to sport.

Level of evidence
IV, systematic review of Level II–IV studies.

BACK

Postoperative alpha angle not associated with patient-centered midterm outcomes following hip arthroscopy for FAI

Karen K. Briggs, Eduardo Soares, Sanjeev Bhatia, Marc J. Philippon

DOI: https://doi.org/10.1007/s00167-018-4933-3

Purpose
The most commonly used parameter for defining cam-type femoroacetabular impingement(FAI) has been the alpha angle. The purpose of this study was to determine if patient-reported outcomes 5 years following hip arthroscopy for FAI were associated with postoperative alpha angle. We hypothesized that patient-reported outcomes would not be influenced by postoperative alpha angle in patients with FAI.

Methods
230 patients had primary hip arthroscopy for FAI and chondrolabral dysfunction. The median age was 40 years (range 18–69). All patients had preoperative and 1 day postoperative alpha angles recorded. At minimum 5 years following arthroscopy, all patients completed an online questionnaire that included the modified Harris Hip score(MHHS), WOMAC, HOS ADL, HOS Sport, SF12 and patient satisfaction. This study was IRB approved. Patients were grouped into two, based on their postoperative alpha angle: <55° (n = 158) and ≥ 55° (n = 56).

Results
The median preoperative alpha angle was 72° (range 50°–105°) and the median postoperative alpha angle was 45° (range 30°–100°). The postoperative alpha angle did not correlate with any outcome measure. The median preoperative alpha angle in the < 55° group was 71° and in ≥ 55° group the median was 74° (p = 0.044). The median follow-up was 5.1 years (range 5–7). The median mHHS was 85 (range 47–100) in the < 55° and 85 (range 54–100) in the ≥ 55° group (n.s); WOMAC was 5 (range 0–73) in the < 55° and 4.5 (range 1–57) in the ≥ 55° group(n.s); HOS ADL was 95 (range 31–100) in the < 55° and 96 (range 50–100) in the ≥ 55° group (n.s); HOS Sport was 88 (range 0–100) in the < 55° and 88 (range 13–100) in the ≥ 55° group (n.s) Median patient satisfaction was 9 (range 1–10) in both groups.

Conclusion
This study shows no statistically significant differences between the investigated patient-reported outcome scores at a 5 years postoperatively in relation to a correction of the alpha angle to 55°. While alpha angle has been shown to be an excellent preoperative diagnostic tool, the postoperative angle does not correlate with midterm outcomes or the development of osteoarthritis based on patient symptoms. The amount of osteoplasty should be based on dynamic examination at arthroscopy, and not by alpha angle.

Level of evidence
III Case–control, retrospective comparative study.

BACK

Virtual reality hip arthroscopy simulator demonstrates sufficient face validity

Jonathan D. Bartlett, John E. Lawrence, Vikas Khanduja

DOI: https://doi.org/10.1007/s00167-018-5038-8

Purpose
To test the face validity of the hip diagnostics module of a virtual reality hip arthroscopy simulator.

Methods
A total of 25 orthopaedic surgeons, 7 faculty members and 18 orthopaedic residents, performed diagnostic supine hip arthroscopies of a healthy virtual reality hip joint using a 70° arthroscope. Twelve specific targets were visualised within the central compartment; six via the anterior portal, three via the anterolateral portal and three via the posterolateral portal. This task was immediately followed by a questionnaire regarding the realism and training capability of the system. This consisted of seven questions addressing the verisimilitude of the simulator and five questions addressing the training environment of the simulator. Each question consisted of a statement stem and 10-point Likert scale. Following similar work in surgical simulators, a rating of 7 or above was considered an acceptable level of realism.

Results
The diagnostic hip arthroscopy module was found to have an acceptable level of realism in all domains apart from the tactile feedback received from the soft tissue. 23 out of 25 participants (92%) felt the simulator provided a non-threatening learning environment and 22 participants (88%) stated they enjoyed using the simulator. It was most frequently agreed that the level of trainees who would benefit most from the simulator were registrars and fellows (22 participants; 88%). Additionally, 21 of the participants (84%) agreed that this would be a beneficial training modality for foundation and core trainees, and 20 participants (80%) agreed that his would be beneficial for consultants.

Conclusions
This VR hip arthroscopy simulator was demonstrated to have a sufficient level of realism, thus establishing its face validity. These results suggest this simulator has sufficient realism for use in the acquisition of basic arthroscopic skills and supports its use in orthopaedics surgical training.

Level of evidence
I.

BACK

Arthroscopic irrigation and debridement is associated with favourable short-term outcomes vs. open management: an ACS-NSQIP database analysis

Mhamad Faour, Assem A. Sultan, Jaiben George, Linsen T. Samuel, Gannon L. Curtis, Robert Molloy, Carlos A. Higuera, Michael A. Mont

DOI https://doi.org/10.1007/s00167-018-5328-1

Purpose
Septic arthritis of the knee is an orthopaedic emergency that is associated with marked morbidity and can potentially be life threatening. Surgical debridement can be performed either arthroscopically or via an arthrotomy. The aim of this study was to compare the 30-day complications and adverse outcomes between the two procedures.

Methods
Patients with a diagnosis of septic arthritis of the knee between 2011 and 2015 were identified using the ACS-NSQIP database. The study population included 695 patients, who had knee septic arthritis and underwent either an arthroscopic irrigation or debridement (I&D) (n = 464) or open irrigation and debridement (n = 231). Preoperative data included demographics, independent functional status, and comorbidities. Outcomes of interest included wound complications, infectious complications, cardiovascular events, hospital readmissions, and reoperations, or any of the previous adverse events.

Results
Both cohorts were similar in most baseline characteristics. Bleeding requiring transfusion was significantly lower in the arthroscopic (n = 13; 3.6%) compared to the open procedure (n = 31; 13.4%; p = 0.0001). Home discharge was significantly higher in the arthroscopic irrigation and debridement group (n = 310; 67.5%) compared to the open group (n = 126; 55%; p = 0.0013). The overall incidence of adverse events was lower in the arthroscopic group (n = 158; 34%) compared to the open group (n = 112; 49%; p = 0.0002). There was no difference in rates of infectious complications, thromboembolic events, hospital readmission, reoperation, or mortality between the groups. Open irrigation and debridement was associated with higher risk of bleeding requiring transfusion (OR = 3.79; 95% CI: 2.02–7.13; p = 0.0001), higher risk of incidence of adverse events (OR = 1.46; 95% CI: 1.02–2.08; p = 0.039), and lower home discharge (OR = 3.79; 95% CI: 2.02–7.13; p = 0.0001) within 30 days after the procedure.

Conclusion
Arthroscopic irrigation and debridement demonstrated favourable short-term outcomes. Patients who underwent arthroscopic irrigation and debridement had lower rates of blood transfusions, lower rates of adverse events, and higher home discharge rates compared to open irrigation and debridement. This study is the largest analysis comparing arthroscopic vs. open irrigation and debridement in a national database sample. These findings conclude that arthroscopic debridement can be an alternative first-line option in managing septic arthritis.

Level of evidence
III.

BACK

Immediate arthroscopy following ORIF for tibial plateau fractures provide early diagnosis and treatment of the combined intra-articular pathologies

Jae-Jung Jeong, Seung-bae Oh, Jong-Hun Ji, Seok-Jae Park, Myung-Sup Ko

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Purpose
To evaluate the effectiveness of immediate arthroscopy and clinical outcomes following open reduction and internal fixation (ORIF) of tibial plateau fractures.

Methods
Sixty patients (36 men and 24 women, median age 56 (20–78) years) were divided into Group I (ORIF only: 26 patients, median age 58 (25–78) years) or Group II (ORIF with immediate arthroscopy: 34 patients, median age 55 (20–75) years) in tibial plateau fractures (Schatzker Type II–VI fractures). In the first part of this study, ORIF only was performed without arthroscopic treatment. In the second part, ORIF with immediate arthroscopic examination and treatment was performed. Clinical outcomes, utilizing range of motion (ROM), International Knee Documentation Committee (IKDC) score and hospital for special knee score (HSS) were assessed.

Results
At the final follow-up, HSS score was 81 ± 11 points in Group I and 83 ± 9 points in Group II. The IKDC score was 85 ± 8 points in Group I and 86 ± 6 points in Group II. In Group II, concomitant intra-articular lesions in 10 patients (29%) were found and treated simultaneously. However, there were no significant differences in clinical scores or ROM between the two groups.

Conclusion
Immediate arthroscopy following ORIF for tibial plateau fracture is an effective procedure that provides accurate information for fracture reduction, leading to immediate treatment of concomitant intra-articular lesions without complications.

Level of evidence
III.

BACK

What are the prevalence and risk factors for repeat ipsilateral knee arthroscopy?

Omar A. Behery, I. Suchman, Albit R. Paoli, Tyler A. Luthringer, Kirk A. Campbell, Joseph A. Bosco

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Purpose
The number of arthroscopic knee surgeries performed annually has increased over the last decade. It remains unclear what proportion of individuals undergoing knee arthroscopy is at risk for subsequent ipsilateral procedures. Better knowledge of risk factors and the incidence of reoperative ipsilateral arthroscopy are important in setting expectations and counselling patients on treatment options. The aim of this study is to determine the incidence of repeat ipsilateral knee arthroscopy, and the risk factors associated with subsequent surgery over long-term follow-up.

Methods
The New York Statewide Planning and Research Cooperative Systems outpatient database was reviewed from 2003 to 2016 to identify patients who underwent elective, primary knee arthroscopy for one of the following diagnosis-related categories of procedures: Group 1: cartilage repair and transfer; Group 2: osteochondritis dissecans (OCD) lesions; Group 3: meniscal repair, debridement, chondroplasty, and synovectomy; Group 4: multiple different procedures. Subjects were followed for 10 years to determine the odds of subsequent ipsilateral knee arthroscopy. Risk factors including the group of arthroscopic surgery, age group, gender, race, insurance type, surgeon volume, and comorbidities were analysed to identify factors predicting subsequent surgery.

Results
A total of 765,144 patients who underwent knee arthroscopy between 2003 and 2016, were identified. The majority (751,873) underwent meniscus-related arthroscopy. The proportion of patients undergoing subsequent ipsilateral knee arthroscopy was 2.1% at 1-year, 5.5% at 5 years, and 6.7% at 10 years of follow-up. Among patients who underwent subsequent arthroscopic surgery at 1-, 5-, and 10-year follow-up, there was a greater proportion of patients with worker's compensation insurance ($p < 0.001$), index operations performed by very high volume surgeons ($p < 0.001$), and cartilage restoration index procedures ($p < 0.001$), compared with those who never underwent repeat ipsilateral surgery.

Conclusion
Understanding the incidence of subsequent knee arthroscopy after index procedure in different age groups and the patterns over 10 years of follow-up is important in counselling patients and setting future expectations. The majority of subsequent surgeries occur within the first 5 years after index surgery, and subjects tend to have higher odds of ipsilateral reoperation for up to 10 years if they have worker's compensation insurance, or if their index surgery was performed by a very high volume surgeon, or was a cartilage restoration procedure.

Level of evidence
III.

BACK

American Journal of Sports Medicine (AJSM), Volume 47, Issue 12

Patient-Specific 3-D Magnetic Resonance Imaging–Based Dynamic Simulation of Hip Impingement and Range of Motion Can Replace 3-D Computed Tomography–Based Simulation for Patients With Femoroacetabular Impingement: Implications for Planning Open Hip Preservation Surgery and Hip Arthroscopy

Till D. Lerch, MD, Celia Degonda, MD, Florian Schmaranzer, MD, Inga Todorski, MD, Jennifer Cullmann-Bastian, MD, Guoyan Zheng, PhD, Klaus A. Siebenrock, MD, Moritz Tannast, MD

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Background Femoroacetabular impingement (FAI) is a complex 3-dimensional (3D) hip abnormality that can cause hip pain and osteoarthritis in young and active patients of childbearing age. Imaging is static and based on 2-dimensional radiographs or computed tomography (CT) scans. Recently, CT-based 3D impingement simulation was introduced for patient-specific assessments of hip deformities, whereas magnetic resonance imaging (MRI) offers a radiation-free alternative for surgical planning before hip arthroscopic surgery.

Purpose To (1) investigate the difference between 3D models of the hip, (2) correlate the location of hip impingement and range of motion (ROM), and (3) correlate diagnostic parameters while comparing CT- and MRI-based osseous 3D models of the hip in symptomatic patients with FAI.

Study Design Cohort study (Diagnosis); Level of evidence, 2.

Methods The authors performed an institutional review board–approved comparative and retrospective study of 31 hips in 26 symptomatic patients with FAI. We compared CT- and MRI-based osseous 3D models of the hip in the same patients. 3D CT scans (slice thickness, 1 mm) of the entire pelvis and the distal femoral condyles were obtained. Preoperative MRI of the hip was performed including an axial-oblique T1 VIBE sequence (slice thickness, 1 mm) and 2 axial anisotropic (1.2 × 1.2 × 1 mm) T1 VIBE Dixon sequences of the entire pelvis and the distal femoral condyles. Threshold-based semiautomatic reconstruction of 3D models was performed using commercial software. CT- and MRI-based 3D models were compared with specifically developed software.

Results (1) The difference between MRI- and CT-based 3D models was less than 1 mm for the proximal femur and the acetabulum (median surface distance, 0.4 ± 0.1 mm and 0.4 ± 0.2 mm, respectively). (2) The correlation for ROM values was excellent ($r = 0.99$, $P < .001$) between CT and MRI. The mean absolute difference for flexion and extension was 1.9°± 1.5° and 2.6°± 1.9°, respectively. The location of impingement did not differ between CT- and MRI-based 3D ROM analysis in all 12 of 12 acetabular and 11 of 12 femoral clock-face positions. (3) The correlation for 6 diagnostic parameters was excellent ($r = 0.98$, $P < .001$) between CT and MRI. The mean absolute difference for inclination and anteversion was 2.0°± 1.8° and 1.0°± 0.8°, respectively.

Conclusion Patient-specific and radiation-free MRI-based dynamic 3D simulation of hip impingement and ROM can replace CT-based 3D simulation for patients with FAI of childbearing age. On the basis of these excellent results, we intend to change our clinical practice, and we will use MRI-based 3D models for future clinical practice instead of CT-based 3D models. This allows radiation-free and patient-specific preoperative 3D impingement simulation for surgical planning and simulation of open hip preservation surgery and hip arthroscopic surgery.

BACK

Portal Placement and Biomechanical Performance of Endoscopic Proximal Hamstring Repair

Michael K. Ryan, MD, David P. Beason, MS, Glenn S. Fleisig, PhD, Benton A. Emblom, MD

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Background Proximal hamstring tendon avulsions are debilitating and commonly cause pain, weakness, and functional limitations. Open surgical repair has been the standard, but improved endoscopic techniques have enabled proximal hamstring fixation with decreased risk of infection and numbness, without the morbidity of a large incision.

Purpose/Hypothesis The purpose was to (1) describe pertinent anatomy surrounding the proximal hamstring origin in relation to 4 endoscopic portal sites and (2) test for biomechanical differences between open and endoscopic repair. It was hypothesized that (1) endoscopic proximal hamstring repair is efficacious with respect to commonly used portals and (2) there is no biomechanical difference between open and endoscopic techniques.

Study Design Descriptive and controlled laboratory study.

Methods Proximal hamstring ruptures were simulated endoscopically in 10 fresh-frozen human cadaveric pelvis specimens. Endoscopic repair was then completed on 1 limb from each specimen through 4 portals. After repair, each specimen was dissected in layers and measurements from portal tracts to pertinent anatomy were obtained. Open repair was performed on all contralateral limbs, followed by cyclical biomechanical tensile testing to failure of both the open and endoscopically repaired hamstring tendons to assess failure load and local tissue strain.

Results On average, no portal tract was closer than 2.0 cm to the sciatic nerve or inferior gluteal neurovascular bundle. Anatomic landmarks were identified that could improve the reproducibility and safety of the procedure. Biomechanical testing revealed no differences between the open and endoscopic repair techniques for any measured parameter.

Conclusion This study supports the safety and efficacy of endoscopic proximal hamstring repair through anatomic and biomechanical analyses and helps establish reproducible and recognizable landmarks that define a safe working zone.

Clinical Relevance This study maps the anatomic landscape of the proximal hamstring as encountered endoscopically and demonstrates equivalent biomechanical strength of endoscopic proximal hamstring repair, supporting this technique’s safety and efficacy.

BACK

Miscellaneous

Arthroscopy, Volume 35, Issue 10

Demographics and Distal Tibial Dimensions of Suitable Distal Tibial Allografts for Glenoid Reconstruction

Stephen A. Parada, M.D., Matthew S. Griffith, M.D., K. Aaron Shaw, D.O., Brian R. Waterman, M.D., Josef K. Eichinger, M.D., Xinning Li, M.D., Matthew T. Provencher, M.D.

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Purpose
To evaluate whether characteristics such as age, height, weight, sex, or body mass index affected the distal tibial dimensions and radius of curvature (ROC) of a potential donor for anterior glenoid augmentation.

Methods
A retrospective review of magnetic resonance imaging of ankles without bony trauma was performed, and the anteroposterior (AP) and medial-lateral (ML) distances and ROC of the tibial plafond articular surface were measured. Demographic characteristics, including age, sex, height, weight, and body mass index, were recorded.

Results
A total of 141 imaging studies were included (73 men and 68 women; average age, 38.2 ± 12.65 years). All potential specimens accommodated harvest of a 10 × 22–mm distal tibial allograft bone block. Men had greater ML (42.74 cm [95% confidence interval (CI), 42.09-43.39 cm] vs 38.01 cm [95% CI, 37.30-38.72 cm]; P < .001) and AP (38.16 cm [95% CI, 37.47-38.85 cm] vs 34.57 cm [95% CI, 33.97-35.17 cm]; P < .001) dimensions. Significant moderately positive correlations were found for AP dimensions with height (r = 0.584, P < .001) and weight (r = 0.383, P < .001) and for ML dimensions with height (r = 0.711, P < .001) and weight (r = 0.467, P < .001). ROC was positively correlated with height (r = 0.509, P < .001) and weight (r = 0.294, P < .001). Patient age was not related to either the AP or ML distal tibial dimensions or ROC.

Conclusions
After magnetic resonance imaging analysis, all potential donors permitted harvest of a standard-sized distal tibial allograft irrespective of sex or common anthropometric measures, and 85.8% showed distal tibial morphology acceptable for glenoid augmentation. AP and ML graft dimensions and ROC correlated significantly with height and weight.

Level of Evidence
Level II, diagnostic study.

BACK